Chest Tube Basics

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What is a chest tube?

• Tube placed through the chest wall into the pleural cavity to drain air or fluid

https://www.allinahealth.org/mdex/ND0429G.HTM
Pleural Cavity

• Normal: 7-14 ml fluid
• Used to balance system based on pressure gradient with drainage of fluid
• Air or excess fluid is not normal
• 0.15 ml/kg/hr fluid is produced by parietal pleura

https://en.wikipedia.org/wiki/Pleural_cavity
Figure 1. Balance of Forces Regulating Pleural Fluid Formation.

The amount of fluid in the pleural space is dependent on the balance of hydrostatic and oncotic pressures between the parietal and visceral pleura and the pleural space. Because hydrostatic pressures are higher on the parietal pleura than on the visceral pleura and the oncotic pressures are equivalent, pleural fluid is primarily produced from the parietal pleura. Likewise, the lymphatic vessels on the parietal pleura are responsible for the majority of pleural fluid resorption.
Indications for Chest Tube Placement

**Air (Gas)**
- Pneumothorax

**Fluid (Liquid)**
- Pleural Effusion

https://en.wikipedia.org/wiki/Pneumothorax

https://www.researchgate.net/figure/Chest-X-ray-left-sided-massive-hemothorax_fig4_281514603
# Indications for Tube Placement

## Pneumothorax
- Spontaneous
- Traumatic
- Iatrogenic
- Tension
- Bronchopleural Fistula

## Pleural Effusion
- Simple (Recurrent)
- Parapneumonic
  - Complicated
- Malignant
- Chylothorax
- Hemothorax
Light’s Criteria

- pH
  - Air in syringe increases pH
  - Time increases pH
  - Lidocaine (6.0) decreases pH

ONLY ONE is required to call the effusion an exudate
Pleural Fluid Tests to Send

**Usual Test Sent**
- Cell count with differential
- Protein
- LDH
- Glucose
- pH
- Cultures
- Cytology

**Others**
- Flow cytometry, Albumin, Triglycerides/Cholesterol, Amylase
- Adenosine Deaminase (ADA)
- Hematocrit
Type of Chest Tubes

- Small Bore (8 -16 Fr)
- Large Bore (18 - 40 Fr)

https://www.cookmedical.com/products/cc_utpt_webds/
Pigtail Catheters

• Smaller diameter (Range from 8 – 16 F)
• Ideal for evacuating air and fluid
• Pneumothorax
  • 8-14 Fr
• Parapneumonic Effusion/Malignancy
  • 10-14 Fr

https://www.cookmedical.com/products/cc_utpt_webds/
Wayne Pneumothorax Kit
https://www.ctsnet.org/article/percutaneous-catheter-spontaneous-pneumothorax
Drainage Systems

• One-bottle collection system
• Two-bottle collection system
• Three-bottle collection system
Three-Bottle Collection System
Wet Suction
Wet Suction

Dry Suction

Level of suction

- Typical initial level of suction is -20 cmH20
- Pneumothorax
  - Recommend trial of water seal first
- Fluid Drainage
  - Trial at -20 cm
  - If draining large effusion, recommend to minimize large volume suction to prevent REPE
What is an Air Leak?

• If presence of air leak
  • Communication between the bronchi/alveoli and the pleural space
  • A Leak in the system outside the chest
Chest Tube Removal

• Cause resolved
• Air
  • Leak resolved at least 24 hours on water seal
• Fluid/Blood
  • Drainage < 100-200 ml/24 hours
• **Order of Trial**
  • Suction → Water Seal → Clamping vs Removal
Clamping Trial

- **Pneumothorax**
  - If questions regarding air leak resolved, a “clamp trial” can be performed
- **Clamped**
  - 4-6 hours
  - Risk of tension pneumothorax
  - If any respiratory difficulty, unclamp immediately